1. A metal matrix composite comprising:

an isotropic reinforcement preform made by partially sintering ceramic particles; and

a metal matrix infused into the preform yielding an isotropic metal matrix composite having an ultimate tensile strength of at least 80 ksi in all directions.

2. The metal matrix composite of claim 1 in which the tensile strength is greater than or equal to 100 ksi.

3. The metal matrix composite of claim 1 in which the metal matrix composite has an isotropic high temperature strength retention of at least 85% up to 500°F.

4. The metal matrix composite of claim 1 in which the metal matrix composite has an isotropic high temperature stiffness retention of at least 95% at temperatures up to 500°F.

5. The metal matrix composite of claim 1 in which the preform has an average pore size of 1-5 microns, an average interconnected porosity 35-45 vol.%, a 100% open porosity, and a flexure strength of greater than 7 ksi.

6. The metal matrix composite of claim 1 in which the ceramic particles are substantially pure.

7. The metal matrix composite of claim 6 in which the ceramic particles are at least 99.0% pure.

8. The metal matrix composite of claim 1 in which the metal matrix material is selected to prevent chemical reaction with the preform.

9. The metal matrix composite of claim 1 in which the particles of the preform are selected from the group consisting of alumina and silicon carbide.

10. The metal matrix composite of claim 1 in which the metal matrix material is selected from the group consisting of aluminum, aluminum alloys, magnesium, magnesium alloys, copper, and copper alloys.

11. The metal matrix composite of claim 10 in which the aluminum is substantially pure aluminum.

12. The metal matrix composite of claim 11 in which the aluminum is 99.999% pure aluminum.

13. The metal matrix composite of claim 10 in which the aluminum alloy is aluminum alloy No. 201.

14. The metal matrix composite of claim 1 in which the metal matrix composite has a coefficient of thermal expansion of less than 7.0 ppm/°F.

15. A metal matrix composite comprising:

a partially sintered reinforcement preform made of ceramic particles; and

a metal matrix infused into the preform yielding an isotropic metal matrix composite having a high temperature strength retention of at least 85% up to 500 °F.

16. The metal matrix composite of claim 15 in which the ultimate tensile strength of the metal matrix composite is at least 80 ksi in all directions.

17. The metal matrix composite of claim 15 in which the metal matrix composite has a high temperature stiffness retention of at least 95% at temperatures up to 500°F.

18. The metal matrix composite of claim 15 in which the preform has an average pore size of 1-5 microns, an average interconnected porosity 35-45 vol.%, a 100% open porosity, and a flexure strength of greater than 7 ksi.

19. A metal matrix composite comprising:

a partially sintered reinforcement preform made of ceramic particles; and

a metal matrix infused into the preform yielding an isotropic metal matrix composite with a high temperature stiffness retention of at least 95% at temperatures up to 500°F.

20. The metal matrix composite of claim 19 in which the metal matrix composite has a high temperature strength retention of at least 85% up to 500 °F.

21. The metal matrix composite of claim 19 in which the preform has an average pore size of 1-5 microns, an average interconnected porosity of between 35-45 vol.%, approximately 100% open porosity, and a flexure strength of greater than 7 ksi.

22. The metal matrix composite of claim 19 in which the ultimate tensile strength of the metal matrix composite is at least 80 ksi in all directions.

23. A metal matrix composite comprising:

a reinforcement preform made by partially sintering ceramic particles to have an average pore size of between 1-5 microns, an average interconnected porosity of between 35-45 vol.%, approximately 100% open porosity, and a flexure strength of greater than 7 ksi, and isotropic properties; and

a metal matrix infused into the preform.

24. The metal matrix composite of claim 23 in which the metal matrix composite has a high temperature strength retention of at least 85% up to 500 °F.

25. The metal matrix composite of claim 23 in which the ultimate tensile strength of the metal matrix composite is at least 80 ksi in all directions.

26. The metal matrix composite of claim 23 in which the metal matrix composite has a high temperature stiffness retention of at least 95% at temperatures up to 500°F.

27. A metal matrix composite comprising:

a preform made by partially sintering ceramic particles to have an average pore size of between 1-5 microns, an average interconnected porosity of between 35-45 vol.%, approximately 100% open porosity, a flexure strength of greater than 7 ksi, and isotropic properties; and

a metal matrix infused into the preform yielding an isotropic metal matrix composite with a high temperature strength retention of at least 85% up to 500°F, high temperature stiffness retention of at least 95% up to 500°F, and an ultimate tensile strength of at least 80 ksi in all directions.

28. A method of making a metal matrix composite, the method comprising:

partially sintering ceramic particles to form a reinforcement preform having an average pore size of between 1-5 microns, an average interconnected porosity of between 35-45 vol.%, an approximately 100% open porosity, and a flexure strength of greater than 7 ksi; and

infusing the partially sintered preform with a metal matrix material.

29. The method of claim 28 in which infusion includes subjecting the preform to the molten metal matrix material under pressure.

30. The method of claim 29 in which infusion includes pressure casting.

31. The method of claim 29 in which infusion includes squeeze casting.

32. The method of claim 28 in which the resulting metal matrix composite has a high temperature stiffness retention of at least 95% at temperatures up to 500°F.

33. The method of claim 28 in which the resulting metal matrix composite has a high temperature strength retention of at least 85% up to 500°F.

34. The method of claim 28 in which the ultimate tensile strength of the resulting metal matrix composite is at least 80 ksi in all directions.

35. The method of claim 28 in which the ceramic particles are substantially pure.

36. The method of claim 35 in which the ceramic particles are at least 99.0% pure.

37. The method of claim 28 in which the metal matrix material is selected to prevent chemical reaction with the preform.

38. The method of claim 28 in which the particles of the preform are selected from the group consisting of alumina and silicon carbide.

39. The method of claim 28 in which the metal matrix material is selected from the group consisting of aluminum, aluminum alloys, magnesium, magnesium alloys, copper, and copper alloys.

40. The method of claim 39 in which the aluminum is substantially pure aluminum